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ECONOMICS OF THE FOOD ANIMAL INDUSTRY IN THE U.S.

W. B. Sundquist

Department of Agricultural and Applied Economics

University of Minnesota
Institute of Agriculture, Forestry and Home Economics
St. Paul, Minnesota 55108

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ECONOMICS OF THE FOOD ANIMAL INDUSTRY IN THE UNITED STATES*

W. B. Sundquist**

This paper has the objective of describing briefly the food animal industry in the U.S. from an economic perspective so as to aid in the subsequent identification of critical research needs relating to production, marketing and distribution. It focuses on beef, pork, lamb-mutton, and poultry meats produced for human consumption. In addition it considers two other major animal product food sources, dairy products and eggs. It thus excludes from consideration fish, minor small ruminants, game animals and horses.

Because the food animal industry in the U.S. is extremely complex and space here is very limited, exceptions can be found to almost any generalization which can be made. And, some important topics will of necessity be omitted from discussion. The seriously interested student of the economics of the food animal industry should review the comprehensive literature which is available relating to this industry and to its several subsectors.

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* This paper draws heavily on other published and unpublished reports, most of which are listed in the reference section. The section on the producer-supply side, particularly, draws heavily, without quotation, on materials by H. Gilliam, R. Martin, G. Rogers and R. Van Arsdall in Lyle P. Schertz and others, Another Revolution in Farming?, USDA, 1979.

** Professor, Department of Agricultural and Applied Economics, University of Minnesota. I acknowledge the assistance of Roy Van Arsdall in developing the outline for this paper and in supplying key information. I absolve him, however, of any responsibility for its final content.

Highlight Dimensions of Production and Consumption

Production

Over the last decade or more livestock production in the U.S. has generally leveled off while crop production has increased dramatically (Figure 1). Preliminary estimates indicate that while crop production had increased by 40 percent from its 1967 level by 1979, livestock production had increased by only seven percent. This slow growth in the rate of aggregate livestock production results from a substantial realized increase in production per breeding unit being offset by an absolute decline in the number of breeding units (Figure 2). But, as we will discuss later, there were big differences in the rates of change between livestock product categories and even in their directions. The rapid increase in crop production, particularly during the 1970's, has generally been attributed to a greatly expanded demand from the commercial export sector particularly for foodgrains (mainly wheat), feedgrains (mainly corn) and soybeans. And, there was no similar incentive to spur expanded food animal production.

Production changes between 1960 and 1977 are shown in Table 1. Percentage changes in each product category will differ some depending on the specific years which are being compared, but the major conclusions remain about the same. Beef production increased dramatically over the 1960-1977 period largely as the result of a major increase in the national beef herd up to 1975 and a shift to more feedlot finishing of cattle which increased both the rates of gain and the marketing weights for cattle. The decline in veal production is mainly the result of two factors: (1) a decline of

Figure 1

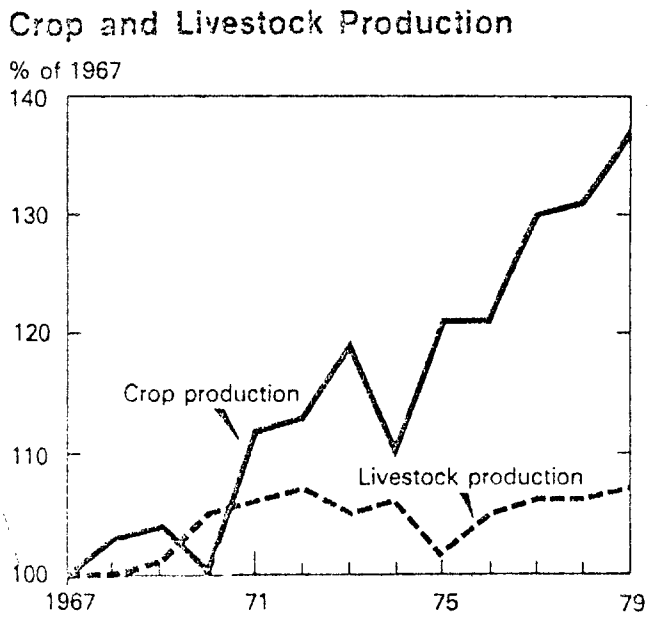
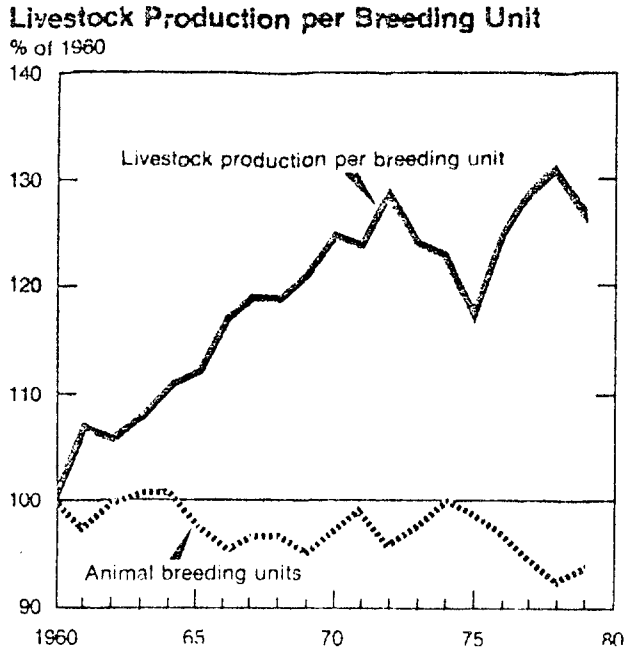


Figure 2



Source: 1979 Handbook of Agricultural Charts. ESCS, USDA.

Table 1

Production of Major Food Animal Products In the U.S. (1960-77)

Product Category	Unit of Measurement	1960	1965	1970	1975	1976	1977	Percent change 1960-77
Beef	Million lbs*	14,753	18,727	21,685	23,976	25,969	25,279	+71.3
Veal	Million lbs*	1,109	1,020	588	873	853	834	-24.8
Pork	Million lbs*	13,905	12,781	14,699	11,779	12,688	13,247	- 4.7
Lamb & Mutton	Million lbs*	768	651	551	410	371	351	-54.3
Chicken	Million lbs**	5,144	6,618	8,465	8,832	9,751	10,131	+96.9
Turkey	Million lbs**	1,166	1,515	1,732	1,804	2,059	2,012	+72.6
Eggs	Million doz	5,339	5,463	5,710	5,365	5,376	5,403	+ 1.2
Milk	Billion lbs	123.1	124.2	117.0	115.6	120.3	123.0	- 0.1

*Carcass Weight Equivalent excluding edible offals.

**Ready to cook basis.

Source: Food Consumption, Prices and Expenditures, ESCS, USDA.

37 percent from 1960 to 1977 in the national dairy cow herd from which most of the veal calves were produced historically and (2) a higher proportion of dairy male calves are no longer vealed but are eventually diverted to the feedlot for finishing.

Total pork production changed relatively little between 1960 and 1977 though the structure of the swine industry changed dramatically. And, though the "hog cycle" diminished somewhat during the period its impact on total production continued to exceed any secular changes in total pork production.

Lamb and mutton production declined by more than half between 1960 and 1977. This major secular decline in the sheep industry, particularly in the "Western ranch-type" component of the industry, has several major causes both internal and external to the sheep subsector. They include among others, high labor and land costs, high losses to predators and strong competition from the poultry, beef and pork subsectors.

Among the major food animal product subsectors, poultry meat (particularly broilers) grew the most rapidly between 1960 and 1977. And, this growth continues. Much increased production efficiency (particularly in feed-meat conversion and labor use) along with specialization of production and vertical integration of the poultry industry have accompanied this rapid growth in the output of poultry meat. While total egg production changed little from 1960 to 1977, integration and specialization of the egg subsector contributed to the rapid disappearance of small producers.

Finally, though total milk production changed little from 1960 to 1977, the secular decline in dairy cow and dairy producer numbers and the secular increases in size of enterprise and degree of specialization continued. And,

major changes occurred in the mix of dairy products to which the milk was converted for human consumption. Though milk production rose substantially in response to much higher price supports for milk in 1976-77 there is considerable evidence that total production has now levelled off again and may or may not resume its decline of the late 1960's and early 1970's. The major drop in dairy cow numbers cited earlier was certainly a major contributor to the earlier decline in milk production and this drop in cow numbers continues.

Consumption

That total supply equals total demand at an equilibrium price for food animal products is a truism. It is, however, an oversimplification of the real world of food animal agriculture. Not all food animal products need be or are consumed in the same period in which they are produced. Moreover, domestic production can in some cases be augmented by imports from foreign producers and some domestic production can be diverted to foreign markets via exports (the latter via commercial sales, concessional sales or gifts, or some combination). Thus, the set of identity equations which balance product supply with demand in the short run include storage and trade components. In addition, a variety of governmental and private entities intervene in the market place for animal production on both the supply and the demand side, particularly the latter. Despite these complexities and others, however, the aggregate annual demand for and consumption of domestically produced food animal products is mainly the

product of the annual per capita consumption rates of U.S. consumers X the U.S. population.[1/] And, since total population increases in the U.S. are now occurring at a very slow rate,[2/] it is mainly changes in per capita consumption rates which induce changes in the long run production of food animal products. Of course, prices for individual food animal products (both absolute and relative to substitute food products) are important determinants of per capita demand as are consumer incomes, product availabilities and consumer tastes and preferences. While not trying to identify the reasons for changes in per capita consumption rates at this juncture, it is instructive to see what has happened to them for the major food animal product groups over the recent past.

Table 2 shows per capita consumption rates for the same food animal product categories and the same time period for which aggregate production figures were shown in Table 1.

In evaluating the changes in per capita consumption levels for the food animal product categories shown in Table 2 it is of interest to note that during the period 1960-77 the retail price index of all food increased by 118.4 percent. Corresponding increases were 46.6 percent for poultry, 47.4 percent for eggs, 96.7 percent for dairy products, 99.8 percent for meat and 196 percent for fish, a major substitute for red meat and poultry. Thus, in

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[1/] This is so because most food animal products produced in the U.S. are not traded extensively by the U.S. in world markets (exports and imports are only a small percentage of domestic production). Moreover, both the high degree of perishability and the high storage costs for meat and fluid milk make intertemporal shifts in their supplies largely uneconomical. This latter phenomenon has the further result of generating large swings in meat prices and thus contributes to the major cycles still present in pork and beef production.

[2/] The civilian population of the U.S. (on which per capita consumption estimates in this report are based) increased from 178.1 million in 1960 to 214.7 million in 1977 for an average annual increase of 1.21 percent. Future population increases are generally projected to occur at an even slower rate.

Table 2
Per Capita Consumption of Major
Food Animal Products, 1960-77

Product Category	Unit of Measurement	1960	1965	1970	1975	1976	1977	Percent change 1960-77
Beef	Pounds*	64.3 (85.1)	73.6 (99.5)	84.1 (113.7)	88.9 (120.1)	95.7 (129.3)	93.2 (125.9)	+44.9 (+47.9)
Veal	Pounds*	5.2 (6.1)	4.3 (5.2)	2.4 (2.9)	3.5 (4.2)	3.3 (4.0)	3.2 (3.9)	-38.5 (-36.1)
Pork	Pounds*	60.3 (77.7)	54.7 (67.2)	62.0 (72.7)	51.2 (56.1)	54.6 (59.5)	56.7 (61.5)	-6.0 (-20.8)
Lamb & Mutton	Pounds*	4.3 (4.8)	3.3 (3.7)	2.9 (3.4)	1.8 (2.0)	1.7 (1.9)	1.5 (1.7)	-65.1 (-64.6)
Chicken	Pounds**	27.8	33.4	40.5	40.6	43.3	44.9	+61.5
Turkey	Pounds**	6.2	7.4	8.0	8.6	9.2	9.2	+48.4
Eggs	Number	335	314	311	279	274	272	-18.8
Dairy Products	Pounds Milk Equivalent	653.4	619.8	561.6	545.7	548.1	551.9	-15.5

*Retail cut equivalent. Numbers in brackets are for carcass weight basis excluding edible offals.

**Ready to cook basis.

Source: Food Consumption, Prices and Expenditures, ESCS, USDA.

general terms, meat and dairy product prices increased at about double the rate for poultry and eggs and at about half the rate for fish. Also, during the 1960-77 period the consumer price index (CPI) rose 104.6 percent. So, using the CPI as a base measure of value during the 1960-77 period, the real price of poultry and eggs at retail dropped substantially, the real price of meat and dairy products dropped slightly and the real price of fish almost doubled.

Per capita consumption of beef increased dramatically (about 45 percent) from 1960 to 1977 while the real price of beef remained fairly constant. And, though per capita consumption of beef (retail cut equivalent) exceeded that for pork only slightly in 1960, it exceeded it by more than 64 percent in 1977. Thus, among the red meat categories, beef has been the big gainer in per capita consumption. This probably reflects a strong consumer preference for beef along with a high producer capacity to provide the product using new feedlot-type production technology. Though consumer preference for veal may have declined during the 1960-77 period, the reduction in per capita consumption of almost 40 percent from 1960 to 1977 was probably mainly an "availability" phenomenon.

The slight decline (6 percent) in per capita pork consumption from 1960 to 1977 is probably mainly the result of the increased availability of beef and poultry meat, the latter at much lower real prices than for pork. As evidenced by the higher percentage of hog carcass weight going into "retail cuts" in 1977 as compared to 1960, there was a continuation of the long term shift of production from "lard type" to "lean meat" type hogs.

Per capita consumption of lamb and mutton declined to 1.5 pounds in 1977. This makes that food animal category of only minor importance to most U.S. consumers except as a "variety" or "specialty" food item.

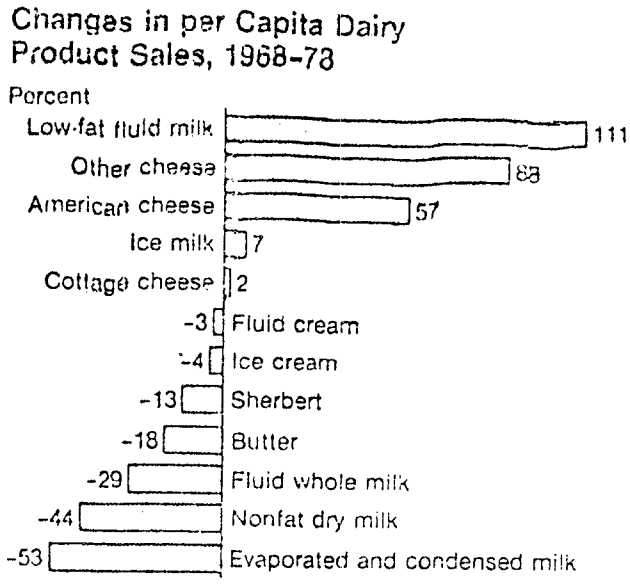
The very major expansion in per capita consumption of chicken and turkey meat between 1960 and 1977 suggests that per capita poultry meat consumption will soon be exceeded only by that of beef. Effective quality control, widespread availability and lower real prices than for other meats have all contributed to the increased per capita consumption of poultry meats as have the increased consumer concerns about animal fats generally and about cholesterol particularly.

Per capita egg consumption increased to 277 eggs in 1978 from the 272 egg level of 1977. This represents the first break in a long term decline in per capita egg consumption and may reflect a rather long-term leveling off in per capita consumption.

Per capita consumption of dairy products also appears to have leveled off in the post-1975 period after a long period of decline. Changes in per capita consumption levels for the past decade (1968-78) are shown in Figure 3 for major dairy product categories. Clearly the strengthening influence in per capita consumption of dairy products has come from low fat fluid milk, cheese and other low fat products. Per capita consumption of high fat products such as butter, fluid cream and fluid whole milk continues to decline.

The decline in per capita consumption of butter is part of a broader phenomenon relating to consumption of fats and oils. In 1960 per capita consumption of fats and oils from animal sources totalled 19.9 pounds. It declined by 43.7 percent o 11.4 pounds in 1977. Meanwhile, per capita consumption of fats and oils from vegetable sources increased by 61.2 percent from 28.6 pounds in 1960 to 46.1 pounds in 1977. Among food animal products, per capita consumption of lard declined by almost 70 percent from 1960 to 1977 (from 7.6 to 2.3 pounds) and per capita consumption of butter dropped about 43 percent (from 7.5 to 4.4 pounds) over the same period. Thus, fats and oil from animal sources have fallen into disfavor with consumers in recent years and this

Figure 3



Source: 1979 Handbook of Agricultural Charts. ESCS, USDA.

phenomenon represents a very major shift in product demand which faces the food animal industry in the future. It appears that many consumers now rely on the food animal industry mainly as a source of highly palatable protein foods and not as a major source of fats and oils.

The Producer and Supply Side of Food Animal Agriculture

Several key dimensions of the livestock and poultry production sector are of major interest from the standpoint of the structure and economics of the sector. They include:

(1) the inventory of livestock and poultry numbers and changes over time
(2) the distribution of these numbers within production and management units
(3) the flow of inputs and products through the production system
(4) the technology used in the production process including some perspective on production efficiency
(5) the flow of financial returns to those firms participating in the production sector including profit levels and
(6) aggregate supply responses for major animal product groups.

As for the aggregate production and per capita consumption figures reported earlier, our brief statistical depiction goes back only to about 1960.

Inventory of Livestock Numbers 1960-78

Table 3 shows the number of food-animal related livestock on farms on January 1, for the period 1960-78 and the percentage change over this period. Because of the short production cycle in poultry, annual inventories are relatively meaningless. For this reason also, we have depicted hog numbers in terms of annual slaughter. While recognizing the need to be cognizant of production cycles in beef and hogs, the data in Table 3 still show several major changes over the decades of the 1960's and 1970's. The 20 percent plus

Table 3
Livestock on Farms*, Total Hog Slaughter** and Percentage Change 1960-78

Year	Cattle and Calves (Mil Head)	Beef Cows (Mil Head)	Other Beef Animals* (Mil Head)	Dairy Cows* (Mil Head)	Sheep and Lambs* (Mil Head)	Hog Slaughter** (Mil Head)
1960	96.2	26.3	39.8	19.5	33.2	84.2
1965	109.0	33.4	50.7	15.4	25.1	76.4
1970	112.4	36.7	55.8	12.1	20.4	87.0
1975	131.8	45.4	67.0	11.2	14.5	69.6
1977	122.8	41.4	62.6	11.0	12.8	78.4
1978	116.3	38.8	58.8	10.9	12.3	78.4
Percentage Change 1960-78	+20.9	+47.5	+47.7	-44.1	-63.0	- 6.9

*January 1 inventory.

**Because of multiple litter farrowings and flexibility in changing size of breeding herd, annual slaughter numbers are reported for hogs.

Source: ESCS, USDA

growth in the national cattle herd was the result of an almost 48 percent increase in beef numbers (70 percent at the cattle cycle peak in 1975) and a decline of almost 45 percent in dairy cow numbers. Sheep and lamb numbers dropped by almost two-thirds and hog numbers mainly cycled over the 1960-78 period but also drifted to slightly lower levels. Rarely, if ever, has the U.S. livestock industry realized changes of these magnitudes over a period of less than 20 years.

Structure of the Production Sector

Despite dramatic changes in livestock numbers over the past two decades, changes in the structure of the production sector have probably been even more pervasive. But, structure differs greatly by category of food animals. Beef: The U.S. beef industry is made up of several components of which the two major ones are (1) cattle raising, centering on the production of calves from beef cow breeding herds but with some mixing of yearlings and other animal classes and (2) the feeding of cattle for slaughter. Though some beef calves move directly from the beef cow herd to the feedlot, others move into intermediate or final stages of grazing and/or limited grain feeding. This occurs under a wide range of programs with respect to time of duration, feeding ration and management systems. Cull cows, dairy steers, bulls and other animals find their way to slaughter either with or without feeding in drylot.

In 1959, almost 2.7 million U.S. farms reported cattle and calves. At that time many cattle herds were a mixture of dairy and beef animals. In 1964, about 1.3 million farms reported beef cows with an average herd size of 25 cows. And, by 1974 only slightly more than 1 million farms reported

beef cows with an average herd size of 40 cows. Also in 1974, as was true a decade earlier, the modal size (over 40 percent of all units) of beef cow enterprises fell into the 20-99 cow range. Thus, though there has been some decrease in the number of herds and some increase in size of herds, beef cow-calf production operations remain the broadest based and least specialized of all major food animal enterprises. And, though beef cow enterprises are the major commercial enterprise on many farms and ranches, they are present on many other farms as a claimant for residual pasture, roughage feeds and/or family labor resources. Beef cow enterprises have disappeared from a number of farms during the past two decades, particularly in cash crop farming areas. But, they grew in size and number in other areas, particularly in the South. In general, however, beef cow enterprises have difficulty in competing for the direct use of highly productive cropland which has strong cash crop or feed grain production alternatives.

Cattle feeding, somewhat in contrast to beef cow herds, has undergone major structural change since 1960. Prior to that time small farmer-feeders (feedlots with less than 1,000 head capacity) produced most of the fed beef. Now more than one-half of the fed cattle marketed are fed in about 420 large commercial feedlots and small farm-feeders account for less than one-third of total fed cattle marketings. At the upper end of the size range 23 feedlot firms of over 50 thousand head one-time capacity fed 14 percent of all cattle fed in 1974. Most small farm-feeder operations are managed as family-scale operations as is the case for most beef cow production enterprises. Large volume, commercial feedlots, on the other hand, exhibit a wide range of organizational structures, including partnerships and corporations. And, many (53 percent in 1974) of the fed cattle marketed from incorporated

feedlots with two thousand head or more capacity were "custom fed" under a variety of contractual arrangements. As of this date the number of small farm-feeders continues to decline (though there were still some 130 thousand lots of one thousand head or less capacity in 1977) and large commerical feedlots continue to increase in number. In addition to cattle feeding, many of the large commercial feedlots are vertically integrated into one or more other functions including cattle raising, meat packing, meat retailing and restaurant businesses.

Hogs: Nearly all hogs were produced in small enterprises prior to 1960. In 1959 almost 1.3 million farms (34.3 percent of all farms) reported market sales of hogs and pigs with an average per farm sales volume of about 64 head. And, even in 1964 only slightly more than 7 percent of total hog sales came from farms selling one thousand or more per year. By 1974 this percentage had increased to 25 and the number of farms selling 200 or less hogs had dropped to about one-half of it's 1964 level. Large volume producers, those marketing 5 thousand head or more annually, account for a rapidly increasing share of total production. One estimate records 1,340 such large volume operations marketing 13.7 million hogs in the United States in 1978. This approaches one-sixth of national production with about a 17 percent annual rate of growth in such large operations in recent years. The rapid growth in large operations has resulted both from the new entry of large operations and the rapid expansion of existing units.

About 80 percent of slaughter hog production now comes from complete hog operations (farrow-to-finish) and 20 percent from split phase operations (pigs produced on one farm and finished on another). Feeder pig production tends to center in areas and on farms where feedgrains are in limited supply but

where adequate labor is available to operate this more labor intensive enterprise. These feeder pigs are then sold to producers who have surplus feed grain supplies but who lack labor and/or facilities for pig production.

Sheep and Lambs: In 1959 about 340 thousand U.S. farms reported sheep or lambs. And, they averaged just under 100 head per farm. By 1974 the per farm average had climbed slightly to about 116 head, but only about 140 thousand farms (41 percent of the 1959 number) remained reporting sheep or lambs. Some specialized sheep operations continue on the Western range but sheep are a supplementary enterprise on many other farms. As of 1975 about one-half (66,500) of the farms reporting sheep were in the North Central States where flock size averaged only 28 head per farm. Thus, the major trend in the structure of the sheep industry in the U.S. is toward many fewer sheep interprises without much increase in enterprise size or degree of specialization.

Dairy: The number of U.S. farms with milk cows declined from over 1.8 million in 1959 to 380 thousand in 1978. And, these numbers compare with about 4.6 million farms reporting milk cows in 1939. Among those farms classified as commercial dairy farms the number totalled about 205 thousand units in 1979. Average herd size on commercial dairy farms was 53 cows in 1979, the product of a steady increase over several decades. Most dairy operations remain of a family - or partnership-scale of operation with most of the forages and at least some of the feedgrains produced on the same farm. This situation differs, however, by region. And, a number of larger-scale drylot operations, with herds of two thousand and up to 10 thousand cows, have been established in California, Arizona and Florida. Many of these large-scale

production units purchase all or most of their feed, both concentrates and roughages, from other producers and concentrate their efforts on producing milk. In contrast to the sheep and beef cow subsectors, few farms have dairy as a supplementary enterprise. Usually it is found as one of the major enterprises and, most typically, it is the major livestock enterprise on farms where it is present.

Poultry: Among the several food animal categories reported here, poultry has undergone the greatest changes, structurally, in the past two decades. In 1959 some 2.2 million farms (about 58 percent of all farms) had chickens and almost 1.1 million produced eggs for sale. At that time over 86 thousand farms reported turkeys with an average of 950 birds per farm. Thus, these components of the poultry industry were still mainly organized as numerous, small-scale enterprises. Commercialization of the broiler sector was, however, already underway by 1959 with some 42 thousand plus farms producing an average of over 33,600 broilers per farm. This per-farm output level was more than double that of 5 years earlier.

By 1974 commercialization had pretty well swept through the poultry industry though the number of producers still continues to decline and the size of poultry enterprises continues to increase. In 1974 only 5,167 farms with 20 thousand or more birds per farm had more than two-thirds of all hens and pullets of laying age. 1,763 commercial turkey farms selling 16 thousand or more turkeys accounted for almost 92 percent of total output. And, 16,534 farms selling 60 thousand or more broilers per farm accounted for almost 92 percent of total output. Though a number of small "farm flock" poultry enterprises continue to exist, they are relatively unimportant from the standpoint of total food production.

Structurally, today's poultry and egg industries involve an extensive network of linkages which have developed between production units and input-supplying and marketing functions. Coordinating systems cover virtually all commercial broiler production and four-fifths or more of all egg and turkey production. In these systems, much production is under contract to marketing firms or carried out as only one phase within vertically integrated firms. A highly integrated firm can involve all or most of the following: breeding flocks, hatchery, feed mill, production units, assembly of live birds or eggs, poultry slaughtering or packing plants, further processing units, delivery vehicles, and distributing centers.

Production Technology and Efficiency

In contrast to an earlier era when food animal production drew mainly on land and labor inputs, some subsectors now resemble a value-added industrial-type industry where farmers or feedlot firms purchase most inputs, use mainly borrowed capital (or in some cases corporate-type equity capital) and manage these resources to turn out a marketable product. This is probably most characteristic of the poultry subsector and some specialized firms in cattle and hog feeding and in large-scale drylot dairy production. It is probably least characteristic of the beef cow and sheep subsectors, family-scale dairying and some hog operations where land and labor inputs still figure heavily in the production process.

Economic pressures for using high levels of production technology and for maximizing production efficiencies are probably greatest in those subsectors of food animal agriculture which are operated on a large scale with mainly purchased inputs. And, they are least intense where the production enterprise uses mainly residual-type resources with low

opportunity costs. But, as the prior information on reduction in producer numbers and the increase in size of enterprises indicates, most food animal production in all categories now comes from commercial producers. As a group they are highly mechanized and use research derived technology and managerial practices in breeding, feeding, housing, health management, product quality control, input buying, product selling, financial management, and in the coordination of these several dimensions of the production process.

Current pressures for increased production efficiency come not only from the competition from other crop and livestock producers and from substitute products but also from inflation induced budget constraints on consumers and from the increased demand for production resources (including land, capital and labor) in nonfarm uses.

No single measure or even several measures of technology or production efficiency describe adequately the current status of the U.S. food animal industry. This is true whether one wishes to compare current overall efficiency with that for some historical period or, as is of more interest here, to assess the potential for future improvements. Clearly, the results of past research and technology have been multifaceted. Some have increased output per unit of land, labor, feed or animal. Others have had the effect of eliminating onerous labor tasks. Still others have had their impact via improving product quality. Most have substituted capital for labor in the production process. And, almost all new technology which has been adopted by producers had the potential for improving producer profits, at least for the early adopters. Clearly, from the producer's viewpoint the major driving forces for adopting new technology have been the dual ones of (1) reducing per unit production costs and (2) increasing total output (and

thus generating additional income). And, the new technology which has been adopted most rapidly and most broadly has permitted both to occur simultaneously as has been the case in the poultry subsector, in large cattle feedlot technology and in commercial hog production. Table 4 exemplifies the type of gains made in feed and labor efficiency in the poultry industry from 1955-59 to 1974-77. These gains were supported by the development of successful methods for management of health problems (particularly via feed medication) and improved housing and equipment. And, they reflect improvements in rate of lay, for example, which are the product of a broad range of improvements all the way from breeding to management. Though all food animal categories have realized some gains in labor and feed efficiency over the past two decades or more, they have generally occurred at a slower rate than for poultry.

Economics of Size and Specialization

One of the mechanisms by which gains in production efficiency have been realized in food animal agriculture is that of production specialization. Producers have been able to obtain higher production efficiencies when they have concentrated their management on one, or generally on at most two, food animal enterprises per farm. And, they have proceeded to specialize at a rapid pace. Since WW II several reasons explain the efficiency gains realized via increased size and specialization. First, most new technology, whether a labor efficient and automated milking parlor, a labor efficient slatted floor hog house with an automated manure disposal system or an automated cattle feedlot complete with feed grinding and mixing equipment, requires a fairly large enterprise in order to exploit fully its capacity and thus its per unit efficiency potential. Moreover, these types of per unit cost efficiencies carry over, in at least some

Table 4
Selected Efficiency Changes in the U.S. Poultry Industry, 1955-59 and 1974-77

Efficiency measure	1955-59	1974-77	Percent change
Feed per dozen eggs	5.4	4.3	-20.4
Feed per pound live broilers	2.7	2.1	-22.2
Feed per pound live turkeys	4.2	3.1	-26.2
Production Efficiency per hour of labor*	40.4	178.0	+340

*1967 = 100.

Source: ESCS, USDA

degree, to such managerial practices as using the futures markets to hedge feed and feeder animal purchases against future product sales thereby improving marketing performance. A second set of reasons for the growth in size of food animal enterprises has been pecuniary in nature. Producers who purchase inputs in large quantities can often obtain discounts in per unit prices. Similarly, they are often able to bargain for price premiums on large-volume product sales. Also, large-scale, specialized producers are more likely to take advantage of special tax provisions such as investment credits and fast tax write-offs of investments in machinery, buildings, equipment, etc., thus reducing their real costs and maximizing this type of pecuniary benefit. Third, the complexity of modern day food animal agriculture requires producers to devote a considerable amount of time and energy (and in some cases to incur considerable cash costs) in order to gather information (on nutrition, breeding, waste management, disease control, finance, marketing, etc.) and to evaluate this information prior to integrating it into their production system(s). Once acquired, the cost per unit of production of this information can be reduced by spreading it over a larger number of product units.

No simple measurement device and no adequate data set exist for measuring the economics of size for all food animal enterprises. But two types of evidence can be brought to bear on the topic. First, some good studies do exist which measure size-cost relationships for selected food animal enterprises. Second, one can draw on "survivorship" data to assess the future economic viability of different sizes of enterprises. For example, if enterprises of a certain size have declined in number over time, it is unlikely that they are of an adequate size to remain competitive in the long

run. If, on the other hand, they are increasing in number, and if they represent an increasing proportion of total production, they are probably of a size that will be competitive for some time into the future, barring major changes in production technology. We turn now to a brief summary of size economics for major food animal categories.

Beef: More than one-half of all feed cattle marketed are now fed in 422 feedlots each marketing more than 30 thousand cattle. This size of feedlot is growing in number and will probably continue to grow both in number and in relative importance. But, numerous smaller feedlots now exist and will continue in the future particularly when farmer-feeders have home grown feed and family labor to service the cattle feeding enterprise. When all production inputs are competitively priced, some per unit cost economies probably exist up to the 30 thousand head size of feedlot and even beyond to 40 to 50 thousand head. Economies of size beyond 30 thousand head capacity are, however, probably mainly the result of vertical linkages which result in high rates of feedlot utilization and/or more effective marketing procedures.

Cattle raising (particularly beef cow herds) is so broad based and so diverse as to almost defy analysis. Clearly, however, the major growth is occurring in herds with 100 cows or more and herds with less than 20 cows are rapidly declining in number. Available evidence suggests that per unit costs for buildings and facilities, machinery and equipment, and perhaps breeding stock investments, decline up to herd sizes of one thousand cows buy may increase for herds beyond this size. Thus, future research, in order to be most applicable, should probably focus on an enterprise size of 100 cows or more but probably not on the very large-scale operations of several thousand head. And, it should probably be assumed that many beef cow enterprises will continue to be operated by producers who have other major farm

enterprises and/or off-farm employment. Thus, the future trend to larger enterprises and more specialization in beef cow-calf production may be a slow one.

Hogs: From a survivorship perspective, hog enterprises marketing less than 200 head of hogs are rapidly disappearing. Rapid growth is occurring in the number of enterprises which market one thousand hogs or more annually. In the production of market hogs (complete farrow-to-finish and feeder pig finishing operations) costs per hundredweight of hogs produced probably decline up to a size of 5 thousand head or more though most of the cost economies appear to occur by a size of 1,600 head marketed. Feeder pig enterprises are diverse and variable but some cost economies probably continue well beyond an enterprise size of one thousand head produced annually. In production of both feeder pigs and market hogs, the major size economies in production costs are in labor, management and capital costs. Feed requirements per unit of output change very little as the size of operation is increased beyond some minimal level.

Dairy: Dairy farms with less than 30 cows have declined in number rapidly and the largest absolute gain in numbers (1950-74) has come in the 50-99 cow size range. Percentage-wise, however, farms with more than 100 cows grew the most rapidly in number during this period and by 1974 they had 26 percent of all milk cows. Significant per unit cost economies are probably present up to 60-70 cows or more on family-scale dairy farms with on-farm forage production and up to a much larger size range (several thousand cows) in the specialized drylot dairies of Arizona, California and Florida. Since dairy production is still a labor intensive enterprise, the major source of

cost economies tends to be in the substitution of capital intensive technology for labor.

Poultry: On a survivorship basis only those production units with more than 20 thousand laying hens, 60 thousand or more broilers and 60 thousand or more turkeys sold annually are increasing both in number and in percent of total production. Laying flocks of 3,200 to 20 thousand hens are still important, however, as are turkey producers marketing from 16 thousand to 60 thousand turkeys. Per unit production cost savings associated with feed and water automation, feed milling, materials handling, etc., probably extend to upwards of 50 thousand broilers sold per year, to 20 thousand or more turkeys and to from 10 thousand to 20 thousand layers. Beyond these enterprise sizes, those economies associated with input acquisition (poults, feed, medication and management assistance) and with product marketing via vertical integration become the dominant factors affecting size economies.

Income, Costs and Supply Response

It is extremely difficult to unravel the complex interrelationships which exist between the supply response of producers and their cost and profit levels. It is even difficult to determine the relationships between annual enterprise profits and after tax returns to farmers and other investors in food animal agriculture. There is, however, a good deal of evidence to suggest that farmers and other investors are willing to accept low current (operating) returns on some investments (such as land, breeding livestock, etc.) in order to realize long term capital gains which are taxed at a lower effective rate. Certain other food animal enterprises, on the other hand, are very sensitive to short-term price and profit levels. Poultry and feeder pig finishing enterprises are good examples

of the latter. The brief discussion which follows is intended only to provide some insight into the income, cost and supply response situation faced by many producers.

Beef: Costs and returns for beef cow-calf producers in recent years indicate that cash income returns have typically covered direct enterprise costs and have provided some limited returns to labor. But, they have not usually covered ownership costs for machinery, buildings, breeding herds and land. With large beef supplies, spiraling land costs and large inflation induced increases in other production inputs continuing for several years, profit levels in cattle raising were driven to negative levels unattractive to both (1) operating farmers and ranchers and (2) non farm investors seeking tax sheltered investment opportunities. This phenomenon resulted in the "liquidation phase" of the beef cycle beginning in 1976. There is widespread agreement that the size of the national beef cow heard had grown to a size in 1975 (45.4 million head) which would not generate profits adequate for its sustainment. And, if the national beef cow herd is to return to its 1975 level or a higher beef prices, reduced production costs, or both. As reduced production of feeder cattle from the smaller beef cow heard is realized, calf prices will rise and the cattle raising subsector will again enter an expansion phase of the beef cycle. But, because of higher production costs, the expansion inducement price level of the future will be much higher than in the past. The current cattle raising liquidation phase of the cattle cycle has been a broad based one as will probably be true for the next expansion phase of the beef cycle as well.

Total fed-beef production costs exceeded returns in 1977 for all classes of feedlot businesses. However, losses were lower than in the previous 3 years when many feedlots were left empty and others operated at sharply reduced capacity. Rapid increases in production costs accompanied by low fed-beef prices left the cattle-feeding industry in a financial crisis during 1974-76. A positive return above total costs was finally realized in 1978 by both commercial and farm feedlots. But, profit margins continue at precariously narrow levels. Experience of the 1970's has shown the large scale commercial cattle feedlots to be more responsive to cost and price levels (and therefore profits) [3/] than many farmer-feeders who tend to continue feeding cattle in the face of highly unprofitable circumstances.

In the expansion phase of the cattle cycle, supply response from the cattle feeding subsector is, of course, dependent on the cattle raising subsector for an expanded supply of feeder cattle. Though cattle can be profitably fed to slightly heavier weights when beef prices are high, this source of supply response has only very limited potential.

Hogs: A study of hog production costs in 1976 indicates that new entrants into hog production incurred total costs averaging almost $50 per hundredweight for all sizes of farrow-to-finish enterprises. These costs ranged from almost $60 per hundredweight for very small enterprises (marketings of 40 head per year) down to almost $42 for enterprises with annual marketings of 5 thousand head or more. Production costs ran much higher for feeder pig production ($85 to $95 per hundredweight). Thus, though the

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[3/] For example, U.S. farmers reduced the quantities of corn and sorghum fed to livestock and poultry by 25 percent between 1973 and 1974 in response to the rapid rise in grain prices which occurred at that time. Much of this adjustment was made by the operators of large commercial beef feedlots.

larger, modernized hog producers have realized reasonable profits in recent years, smaller, less efficient producers have stayed in production only by absorbing some part of ownership costs on facilities and buildings and, in some cases, accepting relatively low labor returns.

On the supply response side, adjustment patterns and economic factors responsible for them have changed dramatically since the 1950's. The expansion and contraction of production by farmers producing hogs has focused increasingly on two groups of producers. One group, including both existing producers and new entrants, has specialized in hog production, enlarging enterprises by increments of substantial size each time favorable profit conditions permitted. The other group, comprised largely of farmers with marginal hog enterprises, older farmers choosing to reduce their farming activities, and farmers who have chosen expansion in other enterprises, maintains hog production while returns are favorable, but ceases hog production permanently when returns become unfavorable. This suggests that the production troughs of future hog cycles probably will not drop as low as those in the past as the more specialized producers stay in production year-after-year. As long as producers can at least recover direct (variable) costs and any part of their fixed costs, it will pay them to continue production. Also, the new labor efficient technology utilized in modernized hog farming is expensive and takes time to construct. This may explain why apparently profitable production conditions in recent years have not resulted in expanded output as quickly as in years past. Moreover, with investment costs now representing a much higher proportion of total production costs than formerly, some measure of the estimated return on investment cost will probably be a better indicator of future supply response for hogs than the hog-corn ratio which predicted supply response so well in earlier periods.

As we suggested earlier for beef, because of increased production costs the next expansion phase of the hog cycle will require a higher triggering price level than in the past. Whereas a hog/corn price ratio of 13:1 was considered breakeven in 1950 (and above which production would be encouraged), the current hog/corn price ratio required to encourage expansion is about 24:1.

Dairy: Among the major food animal product categories, dairy, along with beef cow-calf production, is probably least responsive to short term cost-price (profit) fluctuations. Dairy facilities are expensive to construct and the enterprise is heavily dependent on large roughage and labor inputs. Thus, it is difficult for producers to adjust production levels greatly in response to short term profit levels and it is virtually impossible to be in and out of dairy production from one year to the next. Major increases in the government price support levels for milk in 1976-77 assured most dairy producers of good enterprise profits particularly with feed grains prices down from their high prices of 1973-75. As a result dairy production expanded. But, inflation has pushed dairy production costs to higher and higher levels, and with the less efficient producers, at least, facing less attractive profit levels, milk production has declined some recently. More than for any other food animal production subsector, future dairy production levels will probably be dependent on the price support policies of the federal government. These policies, in turn will probably center on adjusting support prices upward but only at a rate which will cover inflationary costs to producers and will not result in an excessive build up in government stocks of dairy products. Thus, though government policies will likely stabilize future prices and incomes for dairy producers, these policies will

likely be conditioned heavily by the effective demand by consumers for dairy products and will not provide incentives for milk supply expansion in the near future.

Sheep and Lambs: Sheep producers have suffered from a broad range of economic problems including much higher land and labor costs and other labor problems, inflation induced increases in other input costs, heavy losses from predators, increased consumer demand for beef and poultry meats and others. Synthetic fibers, cotton and foreign produced wool have applied similar economic pressures on U.S. produced wool, the joint product produced along with lamb and mutton. As a result of the relatively low lamb and wool prices existing up to the mid-1970's many producers were unable to cover even their direct operational costs. And, as a result they quit farming or shifted to beef cattle production. The secular rate of decline in the sheep-lamb subsector has lessened somewhat in recent years. This reduced rate of decline is expected to continue into the future but there is little evidence to suggest that it will be reversed as some dissatisfied producers continue to shift out of the sheep enterprise.

Poultry: Profit levels have generally been attractive enough to encourage production increases by the larger, more efficient poultry producers. As is the case for hogs, however, the small, less efficient producers have ceased operations at a rapid rate. Feed is the largest and one of the most critical inputs in poultry and egg production, accounting for two-thirds to three-fourths of the cost per dozen eggs or per pound of live broiler turkey. Bird costs, (hen depreciation or chick and poult costs) are the second largest cost item. Labor costs and overhead cost (buildings,

equipment, etc.) are about equal in importance; the former have been declining in importance and the latter are tending to increase. Energy costs are of minor importance in relation to total costs, but are now more critical because of the supply/price situation for that input.

Poultry and egg producers can adjust output during the year through the number of chicks or poults started, changing the frequency of batches raised, adjusting market weights, or culling or recycling layers. Ultimate limits to increases exist, however, in terms of housing capacity and chick or poult supplies from breeding flocks. Year-to-year production responses are affected by past net returns, but there often are several-year lags before large responses occur. It seems likely that, in direct contrast to the sheep-lamb subsector, the poultry industry, particularly the production of poultry meat, faces an expanding future. And, most of the inputs and products of the poultry subsector will continue to flow through a highly integrated production-marketing system.

The Consumer and Demand Side of Food Animal Agriculture

Effective demand for U.S. produced animal food products has, in the past, been principally for domestic utilization. Table 5 summarizes the aggregate domestic disappearance, exports and imports for major food animal product groups from 1960-77. Only for pork and poultry meat did exports exceed 2 percent of domestic use in 1977. And, chicken meat exports, while greater than for any other animal product category, were only 5 percent of domestic use. U.S. produced supplies of beef, pork and dairy products were all augmented by significant quantities of imports. But, only for beef, pork, lamb and mutton did imports exceed 2 percent of domestic use in 1977.

Table 5
Domestic Disappearance, Exports and Imports of
Major Food Animal Products, 1960-77

Product Category	Unit	1960	1965	1970	1975	1977	Item as a Percent of Domestic Disappearance in 1977
Beef & Veal:							
Domestic Disappearance	(Mil lbs)*	16,608	20,650	24,001	26,562	28,033	100
Exports & Shipments	"	57	97	105	124	181	0.6
Imports	"	775	942	1,816	1,782	1,963	7.0
Pork:							
Domestic Disappearance	"	14,057	13,146	14,871	11,959	13,313	100
Exports & Shipments	"	164	149	194	317	399	3.0
Imports	"	222	382	491	439	439	3.6
Lamb & Mutton:							
Domestic Disappearance	"	856	720	663	431	372	100
Exports & Shipments	"	2	4	7	8	6	1.6
Imports	"	87	72	122	27	22	5.9
Chicken:							
Domestic Disappearance	(Mil lbs)**	5,021	6,481	8,230	8,978	9,566	100
Exports & Shipments	"	154	168	182	273	480	5.0
Imports	"	- -	- -	- -	- -	- -	- -
Turkey:							
Domestic Disappearance	"	1,131	1,464	1,662	1,831	1,991	100
Exports & Shipments	"	24	58	43	53	56	2.8
Imports	"	- -	- -	- -	- -	- -	- -
All Dairy Products:***							
Domestic Disappearance	(Mil lbs)	121,444	123,579	117,333	118,000	121,017	100
Exports & Shipments	"	1,029	2,358	990	1,046	992	0.8
Imports	"	604	923	1,874	1,943	1,969	1.6
Eggs:							
Domestic Disappearance	(Mil doz)	5,312	5,430	5,688	5,323	5,323	100
Exports & Shipments	"	44	39	45	62	91	1.7
Imports	"	3	1	28	6	14	0.3

*Carcass weight equivalent exclusive of edible offals.
**Ready to cook basis.
***Milk equivalent
Source: Food Consumption, Prices and Expenditures, Ag. Econ. Report No. 138, ESCS, USDA

Domestic Demand

Historically, the demand by U.S. consumers for food animal products has been principally a function of consumer disposable income, prices of individual food animal products and their close substitutes, and the tastes and eating habits of consumers. But, this situation has grown much more complex in recent years. Consumers now eat more of their meals away from home than formerly and their consumption is conditioned by a broad set of factors such as self imposed dietary constraints, convenience of food preparation and food safety considerations in addition to the historically important income, price and habit factors. And, the self imposed diet constraints are the product of health concerns, concerns about the grain requirements to feed the world population, changing population structure, etc. Many of these variables are undergoing change currently and are not well quantified. Their identification and qualification are, in fact, among the topics needing effective research attention. It is probably the case, however, that consumer incomes and product prices (including the prices of close substitute foods) are still the most important factors affecting aggregate demand for food animal products. These are followed in importance by health related dietary considerations, changes in proportion and types of meals eaten away from home and population changes. In assessing the future demand for meats (beef, pork and poultry) Van Arsdall and Associates [4/] make the following appraisal, "Future demand for these meats will depend on: population growth, growth in real discretionary income, proportion of meals eaten away from home, more fast food outlets, and animal

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[4/] Roy Van Arsdall, Ronald Gustafson and Harold Jones, "The Future for Livestock, Poultry Production". Feedstuffs, June 12, 1978.

consumer resistance to fats and increasing proportions of young and old in the population. Only population growth is expected to favor pork. Beef and broilers are preferred meats: both will benefit from all six factors." In the discussion which follows we do not attempt to estimate future demand for food animal products but rather to describe briefly the major factors affecting demand so that high priority research issues can be better identified.

Effect of Price Changes on Demand: The demand for food, including food animal products, is not as responsive to price change as is the demand for many non-food items. Thus, for food animal products as a group, a one percent change in price will result in a less than one percent change in the quantity of food animal products purchased and consumed. As a result, demand for food animal products as a group is said to be price inelastic. Table 6 shows estimated price elasticities and cross-price elasticities of demand for major food animal product categories, fish and "other food". The upper left to lower right diagonal of this matrix of elasticities shows the estimated change in the quantity of a commodity purchased as the result of a one percent change in the price of that commodity. For example, if red meat prices increase by 1 percent, other things remaining constant, consumption is estimated to decline by .621 percent.

These elasticities show that both red meats and poultry have greater price elasticities (consumption responses to price changes) than do eggs, dairy products, fish and other foods. Thus, if production costs (and subsequently real product prices) can be reduced, one can probably expect greater market response for red meats and poultry than for other major food

Table 6
Price and Expenditure Elasticities of Demand, Composite Groups

Corresponding percentage change in consumption of	Given a 1-percent change in the price of					
	Red Meat	Poultry	Fish	Eggs	Dairy	Other Food
Red meat	-.621	.097	.030	-.006	.026	-.035
Poultry	.573	-.661	-.067	.031	-.359	.032
Fish	.368	-.157	-.419	-.029	-.599	.231
Eggs	-.013	.032	-.009	-.069	.154	-.244
Dairy	.039	-.080	-.056	.033	-.375	.355
Other Food	-.037	.003	.011	-.027	.146	-.217

Source: Livestock and Meat Situation, October, 1979. ESCS, USDA. Based on data for 1953-75.

animal products. Though not shown in Table 6, a price elasticity matrix was estimated with further breakdowns in the classification of meats into beef, pork, chicken and turkey. This matrix was inverted to derive a "price flexibility" matrix for these food animal products. The resulting price flexibilities indicate the following: (1) a change in pork consumption will have a smaller effect on beef prices than will the converse, (2) broiler prices are highly responsive to changes in pork consumption (much more so than for changes in beef consumption) and (3) beef prices are not very responsive to changes in poultry consumption, but pork prices are. These relationships as well as those identified by the price elasticities and cross elasticities of demand can help to show the expected impacts of future research on product prices, on quantities demanded, and, consequently, on producers' profits. But, one must bear in mind that these elasticities are subject to possible change. And, as national averages they mask a wide range of variation in demand response based on the age, income, family structure, life styles, etc., of consumers, and on the forms in which the various foods are consumed.

Effect of Income Changes on Demand: The effects of changes in consumer incomes on the demand for food animal products are not easily quantified. And, they may also be undergoing significant changes at the current time. Nonetheless, income elasticity estimates are presented in Table 7 for major food animal products. These estimates are derived from cross sectional data, for 1965. Though they should be applied with caution, they do illustrate some key relationships worthy of note. For example, as consumers' incomes rise, other things remaining constant, consumers increase their purchases of beef, turkey, lamb and mutton significantly.

Table 7
Income Elasticities for Major Food Animal Product Categories

Commodity	Income Elasticity*	Commodity	Income Elasticity*
Beef**	.280**	Eggs	-.074
Veal	.571	Butter	.293
Pork	.0085	Fresh Milk	.372
Lamb and Mutton	.581	Evaporated Milk	-.642
Chicken	-.035	Cheese	.238
Turkey	.778	Ice Cream	.327

*Average of elasticities derived using ordinary regression and weighted regression procedures.

**Rather clearly consumers differentiate between fed and nonfed beef products. Freebairn and Rausser (AJAE, Nov. 1975) have estimated the income elasticity of fed beef to be 1.61 and for other beef to be -0.21. Thus fed beef stands almost alone as an income elastic (preferred) food animal product.

Source: P.S. George and G.A. King. Consumer Demand for Food Commodities in the U.S. with Projections for 1980. Giannini Foundation Monograph 26. March, 1971. Estimates are based on Household Food Consumption Survey data for 1965.

And, they increase their proportionate expenditures for fed beef, a preferred product, very substantially (see footnote, Table 7). Though not shown in Table 7, the same Household Food Consumption Survey data show that individual consumers in the higher income brackets of households ($20,000 or more) consumed about 8.5 pounds of lamb annually at the time of the survey while those in the lower income brackets (less than $7,000) consumed less than 3 pounds per person. On the other hand, as incomes rise, consumers decrease slightly their expenditures for chicken meat and eggs and hold expenditures for pork about constant. Indications are also that consumers increase their expenditures for most low fat dairy products and cheese as their incomes rise. But, since consumer demand for fats and oils has undergone a major structural decline in recent years, future projections of income elasticities for these products is rather hazardous. Finally, if consumers face even more stringent budget constraints in the future as a result of continuing inflationary impacts on their real incomes, they may respond by adjusting downward their purchases of food animal products, particularly meat. And, they may exhibit revived interest in purchasing a broad range of substitute foods including those from soybean, cereal grain and synthetic sources.

Actually, of course, most food purchases are made by individual households faced with a unique set of budget circumstances. And, these individual households (and other consumer decision units) can be classified in numerous ways. Table 8 presents selected population and food expenditure data for different income groups for 1973-74. Among other relationships, this table illustrates the declining portion of income which is spent by households for food at higher income levels. Thus, not only do food animal

Table 8
Relationship Between Income and Expenditures
For Food, 1973-74*

Income class	Total population	Total reported income	Total food expenditures	Food as percent of income
Dollars		Percent		
Under 5,000	18.19	6.47	15.39	38.88
5,000-8,000	14.14	9.31	13.09	23.01
8,000-12,000	21.17	17.79	20.35	18.72
12,000-15,000	14.47	14.65	14.08	15.75
15,000-20,000	16.07	19.86	17.29	14.26
Over 20,000	15.96	31.92	19.80	10.17

*Data from 1973-74 Consumer Expenditure Survey, Bureau of Labor Statistics.

Source: National Food Review, ESCS, June, 1978.

products compete with other food products for the consumer dollar, but, because of the income inelastic demand for food, they compete for a much smaller proportion of consumer income as income levels increase. In sum, the relationships between income and demand for food animal products are complex. In the aggregate and for most individual products demand is income elastic. Yet, gains in the real incomes of consumers are probably critical if per capita demand for food animal products is to rise much in the future. With higher consumer incomes, fed beef and turkey appear to have the strongest potential as recipients for increased consumer expenditures.

Food Consumed Away-From-Home: The increased incidence of away-from-home consumption of food in recent years is the result of several interacting forces. Higher consumer incomes, the rapid emergence of fast-food eating establishments, the increased number of women employed outside of the home and other dimensions of changing life styles are only some of the factors involved. Each of the above factors could be and has been the topic of major published reports. But, we have space to touch only briefly on these topics. Table 9 shows that, about one dollar in four of the overall expenditures of a sample of U.S. households for food was away-from-home in Spring, 1977. Nationally, however, expenditures for food away-from-home were about one-third of all food expenditures in 1978, up from one-fourth in 1960. And, this percentage is expected to climb even further. As might be expected, both income and family size, and even location of residence, have important effects on the incidence of away-from-home food purchases as does age (Table 10). Lower incomes and larger families both constrain the incidence of away-from-home food consumption as does increased age at least in the post-55 range.

Table 9
Per Capita Value of Food Used in a Week, by Households,
Spring 1977*

	Total	At home	Away from home
	Dollars		
All households	19.91	15.17	4.74
Region:			
Northeast	22.56	16.77	5.79
North Central	19.19	14.61	4.58
South	18.40	14.46	3.94
West	19.99	15.08	4.91
Urbanization:			
Central city	20.69	15.75	4.94
Suburban	20.91	15.54	5.38
Nonmetropolitan	18.17	14.32	3.84
Before Tax Income (1976):			
Under $5,000	17.51	14.99	2.52
$5,000-$9,999	17.26	14.20	3.06
$10,000-$14,999	18.50	14.15	4.35
$15,000-$19,999	19.99	14.99	4.99
$20,000 and over	23.19	16.36	6.83
People living in household:			
One	26.34	20.81	5.53
Two	24.28	18.36	5.93
Three	20.80	15.41	5.39
Four	18.88	14.22	4.66
Five	18.07	13.80	4.27
Six or more	15.52	12.36	3.17

*Data from USDA 1977-78 Nationwide Consumption Survey.

Source: National Food Review, ESCS, Summer, 1979.

Table 10
Relationship Between Age, Income and
Expenditures for Food

Age	Per Capita Median Income	Percent of Income Spent on		
		Food at home	Food away from home	Total food
Under 25	2970	11.2	6.3	17.5
25-34	3210	11.5	4.9	16.4
35-44	2850	13.9	5.0	18.9
45-54	3600	12.6	4.9	17.5
55-64	4080	12.4	4.1	16.5
Over 65	2950	17.4	4.1	21.5
All	3260	13.0	4.8	17.7

Source: 1972-1974 Consumer Expenditures Survey, Bureau of Labor Statistics.

Diet and Health Concerns: Health concerns have led to increased per capita consumption of low fat and so called "natural" foods both in the U.S. and in other developed countries. We mentioned earlier the rapid decline in demand for fats from animal sources. And, though sales of health foods currently account for only about one percent of the national grocery bill, an estimated 350-400 health food manufacturers now distribute their products nationally and about that many more locally. This represents a phenomenal percentage growth since 1960.

A somewhat different dimension of food health concerns is that identified by the Delaney clause enacted in 1958 as part of the Food Additives Amendment to the Federal Food, Drug and Cosmetics Act. This Amendment states that, "No additive shall be deemed to be safe if it is found to induce cancer when ingested by man or animal, or is found, after tests which are appropriate for the evaluation of the safety of food additives, to induce cancer in man or animal". Of particular concern to the food animal industry is the future use of nitrites as a preservative for use in cured meats such as ham and bacon. Nitrites can combine with substances called amines that form nitrosamines and these have been linked to lymphatic cancer in rats. The nitrosamines issue and a number of other food animal product-health related issues have been addressed extensively in the literature. 5/ But, their impact on current and future demand for food animal products is still unclear as of this date and needs effective research attention.

5/ See particularly the report by CAST pending publication and entitled, "Food from Animals" and a number of reports centering on individual food-health issues.

Other Factors Affecting Demand: A complex set of additional factors affect the domestic demand for food animal products. These include changing life styles, changing population structure and such factors as concerns about, "the need to use grains to feed the world's human population instead of animals". And, these and other factors interact with the effects of prices, incomes and location of food consumption. One recent food growth area has been that of household gardens. The value of fruits and vegetables grown in such gardens was estimated at $14 billion in 1977. The significant concentration of this garden food production among low income groups suggests that it is partially an "income problem induced" phenomenon. Yet, some garden production is clearly related to life style preferences and to the desire for natural foods. And, its general impact on the demand for food animal products is a negative one.

The impact of changing population structure on food demand is complex. But, neither the "very young" nor the "very old" in the population are heavier consumers of meat and other food animal products though young children are important consumers of milk and ice cream. Clearly, the effects of changing population structure on the demand for food animal products needs creative research attention.

In summary, changing life styles can be expected to have a diverse effect on the demand for food animal products. Some consumers will increase their demand for convenience foods for home use and will resort to more away-from-home food consumption. Others will increase their demand for natural foods, including those produced commercially and from household gardens. The latter will probably have some net negative

effect on the demand for food animal products. But, food animal products may gain as the demand for food convenience increases both at home and via fast-food outlets.

Export Demand

As reported earlier (Table 5) export markets have not been of major consequence to the U.S. food animal industry in the past. And, the bigger concern by the U.S. food animal industry has been to curtail the level of imports to the U.S. When feasible, most food importing countries prefer to import grains rather than the more expensive animal products. Thus, mainly food grains (principally wheat and rice) are imported for direct human consumption. And, where income levels permit, food grain imports are augmented by the import of feed grains to support the internal livestock production sector.

The U.S. food animal industry can expect to continue its modest exports of live animals for breeding purposes. In addition, exports of some grain fed meats are likely to those countries (mainly Japan and Western Europe) where higher consumer incomes permit their purchase. A brief evaluation of effective export demand for major food animal products follows. Numerous available publications report the evaluation of export demand in more detail.

Dairy Products: Probably very little potential for significant expansion in exports exists. Surplus dairy supplies in Western Europe and a low cost dairy industry in New Zealand effectively preclude increased effective demand for U.S. exports. In addition, U.S. dairy producers need high product prices in order to realize profits from exports.

Poultry and Eggs: Probably very little potential for export expansion exists except for poultry meats. In the long run, if poultry meat imports increase greatly in a country, that country is likely to resort to developing its own poultry industry further even if it needs to import feed grains and poultry production technology in order to do so.

Red Meat: Red meat exports have been drifting upward in recent years even though total exports remain relatively small. In 1978, exports of steaks, roasts, etc., totalled about 450 million pounds or about one percent of U.S. production. In addition, exports of variety meats (kidneys, liver, tripe, etc.) totalled about 410 million pounds.[6/] In the case of variety meats, these products are regarded as a delicacy in many foreign countries but are not a preferred food item among U.S. consumers. It appears likely that exports of U.S. grain fed beef will expand somewhat in the near future as consumer incomes rise overseas. The extent of such increase will probably depend heavily on the import policies of Japan and Western European countries and on the extent to which a fed beef industry develops in Western Europe. There appears to be little likelihood of expansion in effective export demand for nongrain fed beef from the U.S. And, any growth in pork exports will almost certainly be very modest. Overall, it appears that, at least for the foreseeable future, most of the effective demand for U.S. produced food animal products will continue to be from domestic sources although some effective research on the foreign market potential for grain fed beef and poultry meats appears well justified.

6/ In that same year the U.S. imported about 2.86 billion pounds of meat, mostly for stews, sausages and hamburger.

Marketing and Distribution and Food Animal Products

Marketing and distribution of food animal products in the U.S. is accomplished via a broad set of activities and services performed by a combination of private firms and governmental agencies. In order to split out the costs of marketing and distributing farm produced foods, consumer expenditures for farm foods are sometimes broken down into their "farm value" and their "marketing bill" components. The marketing bill is then further divisible into subcomponents for transportation, processing, wholesaling, retailing and food service.

The above categorization of marketing and distribution within the "marketing bill" excludes from direct scrutiny, however, that set of activities which results in the change in ownership from producers to next owners (principally processors) of food animals and food animal products. Thus, we give brief attention next to the "producer sales" function of marketing before considering the marketing bill components in more detail.

Producer Markets:

The institutional mechanisms for transferring product ownership from producers vary greatly for the several major food animal products. And, where complete or partial integration exists between production and marketing, neat transfer of ownership from producers may not even occur at this stage. In general, two major concerns exist with respect to producer markets for livestock and livestock products. These are (1) that they be cost efficient and (2) that they accurately reflect product value. The latter phenomenon is sometimes expressed as a cencern about "fair and accurate" price discovery.

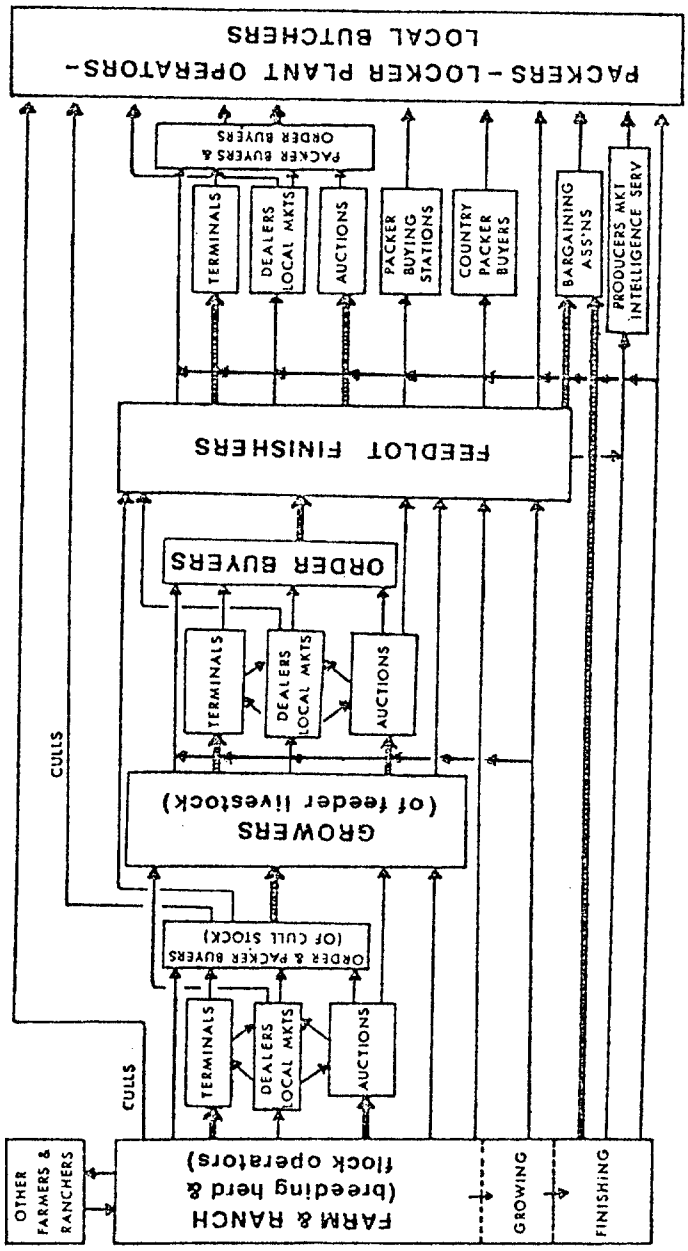
As mentioned earlier, most chickens, turkeys and eggs move through a vertically coordinated production and marketing system. And, though both spot and futures public market price quotations exist for broilers and eggs, spot markets are based on a fairly thin volume of sales transactions. Increasingly, dairy producers market their milk through a system of producer owned cooperatives which also take on the processing function. A number of private firms, particularly those engaged in cheese manufacturing, still provide an operational market for milk in some areas, often under contract with producers. By far the broadest set of public market institutions exists for cattle, hogs and sheep. Thus, it is to the market place for these animals that we now turn in more detail.

Figure 4 shows a schematic diagram of market channels for livestock. Concurrent with the operation of this "physical transaction" market is the operation of active futures markets in feeder cattle, market cattle, hogs and pork bellies. With the advent of large-size cattle and hog feeding enterprises, and with extensive decentralization of packing plants into major production areas, a higher proportion of slaughter ready animals are now sold via direct (on farm) buying by packers. Terminal and auction markets still perform an important role in the selling of market livestock as do a variety of other contractual arrangements. A broad set pf institutional mechanisms also exist for the marketing of feeder livestock. As might be expected, producer cooperatives play a significant role in these market transactions as do individual feeders, order buyers and both auction and central markets.

The literature on cost and pricing efficiency of markets for livestock and livestock products is voluminous. Without trying to estimate these efficiencies we list below briefly some of the continuing concerns expressed about the markets.

Figure 4.

Schematic Diagram of Livestock Market Channels*



* Wide arrows are channels in which professional marketing assistance is used by livestock producers.

Source: John McCoy, Livestock and Meat Marketing, 1972.

Livestock Markets: There is widespread concern that producers do not use existing marketing institutions and mechanisms as effectively as they might. This is particularly true for futures markets but for various spot (cash) markets as well. Extensive use of the "Yellow Sheet", a daily market news report, as a guide for the bid price of live cattle by slaughtering firms may be a "thin and risky" source of information for pricing of beef. This latter issue resulted in the establishment of a Meat Pricing Task Force by the Secretary of Agriculture in March, 1979. And, there are other concerns about market pricing information and methods particularly in areas where livestock markets are few in number and widely dispersed geographically. Finally, increases in energy costs and/or changes in the location of animal production (particularly for cattle) may signal further changes in the location and structure of livestock markets. This phenomenon appears to warrant research study.

Dairy Marketing: The current pricing system for milk puts substantial power in the hands of a small number of large producer cooperatives and governmental agencies. This is resulted in questions about the adequacy of consumer protection in the pricing process and whether product pricing is regionally equitable and efficient. Some regional price differences for milk do not appear to be the result of a fully competitive pricing system.

Poultry and Egg Marketing: Most concerns center on the thin market of public sales transactions from which any industry pricing system must now be established. This thin market is of particular concern for eggs and, to some extent, for chickens and turkeys. It results from the very high incidence of vertical integration in the broiler and egg sectors. The concern centers on the accuracy of publicly quoted prices as a measure of supply and demand.

The Marketing Bill: Compared to all farm food, a lower proportion of consumers' expenditures for food animal products goes to pay the "marketing bill" for these products and more is allocated to "farm value" (Table 11). But the marketing bill component for food animal products is still high (33 to 49 percent of prices at retail and, on an absolute basis, rising rapidly. Thus, marketing and distribution costs are critical components of food animal product prices at retail. Moreover, the economic activities in the marketing and distribution of food animal products are important in their own right generating a large volume of income and employment.

The make-up of the farm-food marketing bill will differ some for food animal products, as a group, compared to all farm food products. And, it will differ also for individual food animal products. Despite these differences, Figure 5 provides some useful perspective on the major items included in the farm-food marketing bill as of 1978. As an individual component, labor costs at 47 percent of the total represent much the largest item followed by packaging, 12 percent; transportation, 8 percent; and corporate profits, 7 percent. In looking ahead to 1980, industry analysts have projected an increase of from 9-12 percent in the marketing bill for farm food from the level of 1979. And, with an actual decrease in labor productivity already registered for 1978 and probably for 1979, rising labor costs per unit of product along with much higher energy costs are heavy contributors to this large increase in the marketing bill.

A somewhat different perspective on the incidence of the farm food marketing bill for food animal products is presented in Table 12. These 1978 data show that the marketing bills for meat and poultry products

Table 11

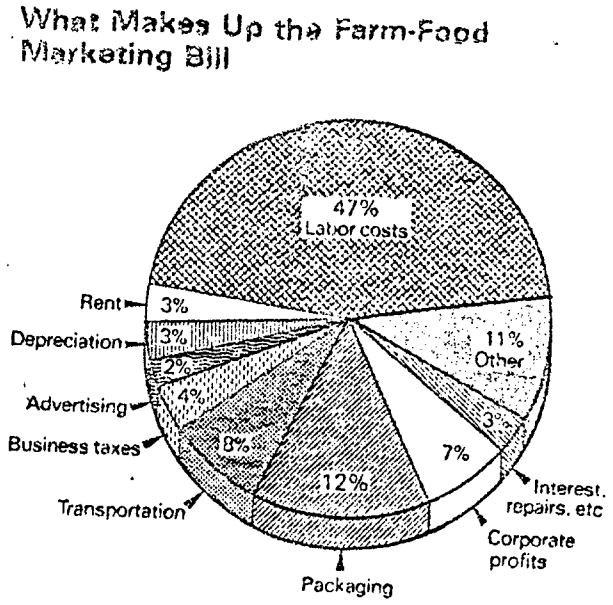
Farm and Marketing Bill Shares of

Retail Food Prices for Selected Farm Foods, 1978

Farm Food	Farm Share	Marketing Bill Share
Eggs	67	33
Meat Products	58	42
Poultry	58	42
Dairy Products	51	49
Average of Market Basket of Farm Foods	39	61
Fresh Fruits and Vegetables	19	81
Baking and Cereal Products	14	86

Source: 1979 Agricultural Chartbook. ESCS, USDA

Figure 5



Transportation is intercity rail and truck. Corporate profits are before taxes. Other includes utilities, fuel, promotion, local hired transportation, insurance, etc.

Source: 1979 Handbook of Agricultural Charts, ESCS, USDA

Table 12

Consumer Expenditures, Marketing Bill, and Farm Value by Where Consumed for Selected Commodities in 1978

Item	Meat	Poultry	Dairy Products	Total of all Farm Foods
		(Millions of Dollars)		
Consumer expenditures	63,746	15,152	29,279	212,425
At-home	35,666	10,231	19,965	146,435
Away-from-home	28,080	4,921	9,314	65,990
Public eating places	24,649	4,367	7,063	54,123
Institutions	3,431	553	2,251	11,866
Marketing bill	35,952	7,882	17,138	144,076
At-home	14,435	3,659	9,803	90,585
Away-from-home	21,517	4,223	7,335	53,491
Public eating places	19,150	3,795	5,653	44,260
Institutions	2,367	428	1,681	9,229
Farm Value	27,794	7,269	12,141	68,346
At-home	21,231	6,571	10,162	55,847
Away-from-home	6,563	698	1,979	12,499
Public eating places	5,499	572	1,410	9,864
Institutions	1,064	126	570	2,636

Source: Agricultural Outlook, November, 1979
ESCS, USDA

consumed away-from-home exceed by far those for meat and poultry products consumed at home. And even for dairy products, almost 43 percent of the total marketing bill was associated with products consumed away-from-home. Thus, marketing of food animal products has changed dramatically from the time when most products were purchased in the local food store or butcher shop and prepared and consumed by the family in the home.

In addition to the regular marketing and distribution services performed by the private sector, federal, state, and local governmental agencies provide a broad set of services including the provision of health inspection, maintenance of sanitation standards, and operation of a broad set of animal health programs, price support programs, market orders, market news, import controls, acquisition and disposal of surplus products by the Commodity Credit Corporation, PL-480 programs, domestic food aid programs and many others. Though most of these services do not enter directly as charges in the food marketing bill, they certainly do affect the economic environment in which the marketing and distribution processes for food animal products occur. And, they do not come free!

We cannot undertake here to describe in detail the marketing and distribution activities associated with the food animal industry. Rather, we attempt only to identify briefly the role and magnitude of the different components of the marketing and distribution system in order to help identify key issues needing future research attention.

Transportation: The U.S. food animal industry is highly dependent on a complex and efficient transportation system both to move massive supplies of production inputs, including feedstuffs, to producers and to move

intermediate products (particularly feeder cattle and feeder pigs) and final products to their respective destinations. Live animals and animal products, particularly, must be transported at reasonable cost and with minimum loss in quantity and quality of cargo. Since most animals and animal products have a high degree of perishability and bulk, transportation is a major cost item for the food animal industry. The transportation component for the farm food marketing bill was estimated at $10.9 billion in 1978. And, though it is difficult to break transportation costs down by individual food animal categories, the annual cost of shipping livestock and meat products to and from slaughter plants alone was estimated at $800 million for 1975-77. Also, transportation costs for the widely dispersed dairy sector with its highly perishable raw milk and manufactured diary products, represent a major component in the market bill for that sector.

Of particular concern to the food animal industry is the rapid increase in energy and labor costs which are important in transportation. But, also of critical importance is the need to keep the nation's rail and highway system in effective operating condition. Water transportation is important to the food animal industry mainly in the movement of some feedstuffs and fuel only, thus increasing the pressure on other higher labor- and energy-use transportation modes for moving food animal products. In addition to keeping the physical facilities of the transportation system in efficient operating condition, there is a critical need to maintain a system of efficient pricing, rate structure regulation and performance in both intrastate and interstate transportation. Thus, the outcome of current discussions relative to deregulation in trucking and rail transportation

could be of crucial significance to the food animal industry. With recent disruptions and cost surcharges in the trucking industry due to fuel shortages and high prices still freshly in mind, together with rail rate increases of 13 percent in 1979 over year earlier levels, constructive attention (including perceptive research) needs to be directed to the transportation system servicing the food animal industry.

Processing: Until 1977 processing was the largest cost component in the farm food marketing bill. But, in that year retailing costs moved to the number one position. The processing component of the farm food marketing bill still remains a major item totalling $37,584 million in 1978. Moreover, processing, broadly defined, still remains a major functional activity in the marketing of food animal products, particularly for red meat, poultry and dairy products. The meat packing industry is the largest single component of the food animal processing sector with total operating costs (exclusive of the cost of livestock and other raw materials) of $8,632 million in 1978 [6/] of which 52 percent went for wages and employee benefits. And, an estimated 163 thousand persons were employed in meat packing plants and 148 thousand in the fluid milk and cheese industries alone in 1979. [7/]

6/ Source: American Meat Institute's Annual Financial Review of the Packing Industry.

7/ Source: U.S. Department of Labor, Bureau of Labor Statistics.

Among the economic topics receiving concerned attention in the food manufacturing industry are those relating to degree of concentration within the industry and the relationship of size of firms to per unit costs. In general, the average industry concentration in food and kindred products is high relative to most industries. For example, the share of total food manufacturing industry assets owned by the 50 largest firms was 56 percent in 1974 compared to 41 percent in 1950. And, there have been large declines, (of the order of one-half) in the total number of food manufacturing firms in the U.S. since 1947. At least one study has estimated that monopoly power is present in food processing and has resulted in multi billion dollar overcharges to consumers. 8/ Despite the above cited trends toward concentration in food processing, however, there has been some decentralization of the meat packing industry from major terminal market cities into the major livestock production regions in recent years. And, there remain some 17 National packers (those with $250 million or more in annual sales) and more than 40 regional packers (those with product sales of $25 million to $250 million annually). Overall, it does not appear that concentration in food animal product processing is nearly as acute as is the case, for example, in the dry cereal manufacturing sector of food processing. Raw material assembly costs are probably an important factor in keeping some dispersion in the structure and location of the food animal product processing industry.

8/ Parker, Russell C. and Connor, John M., "Estimates of Consumer Loss Due to Monopoly in the U.S. Food Manufacturing Industries", Contributed Paper, American Agricultural Economics Association, Blacksburg, VA August 6-9, 1978.

The technical studies of the National Commission on Food Marketing provide the most comprehensive perspective available on cost structure in the food manufacturing industry as of the mid-1960's. These technical studies present estimates of cost-scale relationships for cattle and hog slaughter, broiler and turkey processing and processing of fluid milk and major manufactured dairy products. The conclusions reached in these studies were that important scale economies exist in these phases of food marketing but are achieved by "medium-size" plants relative to the size of the total industry. For example, most in-plant economies were estimated to be achievable by plants handling 1 percent of the poultry supply, 2 percent of the turkey supply and a similar or smaller portion of the milk supply.

There was clearly a great need for consolidation and growth of individual firms in food animal product processing in the period following World War II. This was particularly true for dairy and poultry processing. Such consolidation continues in dairy processing where the number of butter plants decreased by 34 percent between 1972 and 1977 while production per plant increased by 50 percent. But, much of the size adjustment in dairy processing plants may now have been accomplished. For example, as of 1977 butter plants producing 8 million pounds or more annually accounted for over two-thirds of total production while American cheese plants producing over 10 million pounds accounted for 54 percent of the total output of that product. Both a high proportion of new, efficient plants in the industry and the extremely high cost of new plant construction suggest a likely moderation in the rate of future change. Some additional

trend to decentralization of livestock marketing and meat packing, on a selective basis, may occur in response to higher energy costs and/or to changes in the location of animal product supplies. The scale, technology and location of dairy and poultry processing facilties, on the other hand, are probably pretty well set for the near future.

There is strong evidence that labor union practices have retarded the rate at which some cost efficient operations (principally those involving centralized meat cutting and boxing) have been adopted in the meat packaging sector. But, a major part of the cost increases due to packaging, precooking, and other built-in food conveniences features for food animal products, have resulted from the consumer demand for them. Labor productivity continues to be a concern since, despite the adoption of much labor saving technology, labor productivity in the manufacture of farm originating food increased by only about 1 percent per year from 1972-77.

Wholesaling and Retailing: Though wholesaling and retailing are rather distinct marketing activities they are closely related in that wholesaling activities are set up largely to service retailers and the larger-scale away-from-home eating establishments. Wholesaling of farm food employed an estimated 655 thousand people in 1978 and added an estimated $21,903 million to the marketing bill. Retailing, the largest single functional component of the farm food marketing bill, employed 1,743 thousand persons in food stores alone and added $39,975 to the market bill. Both wholesaling and retailing are labor intensive activities with labor costs representing 43 and 48 percent of total costs, respectively. Labor

productivity in food stores is a continuing problem as it dropped an average of 1.2 percent per year between 1972 and 1977 and the drop continued through 1978 and into 1979.

Table 13 provides a breakdown of the distribution of marketing costs for key food animal products sold at retail and points up the importance of the wholesaling and retailing functions, particularly the latter, to prices for these products. One needs to keep in mind, moreover, the high proportion of marketing bill costs for meat, poultry and dairy products that are incurred in the away-from-home sector (Table 12).

Our discussion of the food wholesaling sector will be brief because it is difficult either to separate this functional sector or to generalize about it. For example, most large retail chains are integrated into wholesaling and perform this latter function even though their primary business is food retailing. And, some food manufacturing firms are also integrated into the wholesaling business. As manufacturers sales branches and offices, representatives of food manufacturers handled about 20 percent of the food wholesaling business in 1972. Also, some of the big firms in the rapidly growing food service industry have integrated into the wholesaling business and even into the contracting for supplies from producers.

Concentration has increased in the food wholesaling sector since the early 1960's. Between 1963 and 1972 the number of wholesale "establishments" decreased by 8 percent to about 39 thousand. And, the percentage decline in the number of wholesale "firms" was even greater. As a group "Specialty Merchants" are the largest in number among wholesalers and handled about 41 percent of industry sales in

Table 13

Distribution of Retail Price According to

Marketing Function, 6 Food Animal Products, 1974

Food item and retail unit	Assembly and Procurement	Processing	Intercity Transport.	Whole-saling	Retailing*	Retail Price
		(CENTS)				
Beef, Choice (pound)	1.7	8.3	1.3	8.2	33.2	138.8
Pork (pound)	1.9	13.3	1.4	6.4	24.4	108.2
Broilers (pound)	1.4	7.2	1.4	3.3	11.2	56.0
Eggs, grade A or AA large (dozen)	1.2	8.9	1.5	3.2	10.3	78.3
Milk, sold in stores (1 1/2 gallon)	2.7	10.7	**	13.6	10.5	78.4
Butter (pound)	3.3	8.9	1.5	5.4	16.8	94.5

Source: Kenneth R. Farrell, "Market Performance in the Food Sector," ERS-653, USDA, 1977.

* In-store costs only

** Included in wholesaling.

1972. In addition to the manufacturers sales branches and offices mentioned above, General Line Merchants and Agents and Brokers each handled about 19 to 20 percent of the wholesale business in 1972. As might be expected with the high concentration rate among food manufacturing firms, concentration in wholesaling was greatest among manufacturers sales branches and offices. And, it appears likely that in the future even more control of the wholesaling function will come from food processors and retailers and from the very largest firms in the food service industry.

In terms of function, food wholesalers in the future can be expected both to broaden their services and to provide more specialized attention to individual firms in the food retailing and food service sectors. Financing, promotion, site selection, inventory controls and general computer services are among the services which will likely be expanded by wholesalers.

There has been a big increase in concentration in the food retailing sector since World War II largely as a result of the growth in supermarkets generally and in supermarket chains, particularly. This structural adjustment has continued through the 1970's. In U.S. metropolitan areas the 4 largest grocery firms' share of the total grocery sales increased from 46 to 52 percent from 1954 to 1972. And, in 1972, supermarkets with annual sales of $1 million or more accounted for an estimated 68 percent of total grocery store sales. By 1978 their share had increased to 77 percent.

The 1970's also saw a rapid growth in so called "superstores" in which nonfoods and general merchandise are also sold and "convenience stores" have grown in number as food outlets during the past 20 years. At the end of 1977 there were about 32 thousand convenience stores with sales of $9.7 billion. 9/ These stores do not, however, account for a very major share

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9/ Robert E. Frye, "Our Food Distribution System: Developments and Issues". Unpublished Paper, May, 1979.

of total food sales. Finally, though many changes are still occurring in food retailing, some adjustments are now virtually complete. This is true, for example, of the shift from home delivery to bulk store sales of dairy products and eggs.

As in the case of food processing, the emergence of large-scale food retailing firms coupled with increased concentration within the industry has led to charges of abusive monopoly powers. And, recent study prepared by the Joint Economic Committee of the Congress, estimated that "monopoly overcharges" for the four largest food retailing firms totaled $662 million in 1974 or 1.6 percent of sales.[10/] In order to provide some perspective on the levels of profits in the food processing and retailing sectors, we have included a comparison of their profit levels for 1963-75 with those in all manufacturing industries (Table 14). These data suggest that, whether or not monopoly powers exist, and at least some probably do, the after-tax profits of firms in food processing and retailing are, at most, a modest proportion of the total final costs to consumers of food animal products. The paucity of good evaluative information on profits in the marketing and distribution sectors of the food animal industry does, however, suggest the need for solid economic research on this topic.

Food Service: No single portion of the U.S. food industry has changed as drastically or grown as rapidly in recent years as the food service industry.[11/]

[10/] Marion, Bruce W., et. al. The Profits and Price Performance of Leading Food Chains, Joint Economic Committee, U.S. Congress, Government Printing Office, Washington, D.C., April 12, 1977.

[11/] A quick and comprehensive perspective on this industry can be found in: Michael Van Dress, "An Overview of the Food Service Industry", National Food Review, ESCS, USDA, Summer, 1979.

Table 14

Profits After Federal Income Taxes of Food Chains and Manufacturers,

Annual 1963-75

Year	15 leading food chains*	Food manufacturers**	All manufacturing industries**
	Percent return on stockholder equity		
1963	11.4	9.0	10.3
1964	11.5	10.1	11.7
1965	11.3	10.7	13.1
1966	11.4	11.3	13.6
1967	10.3	10.9	11.8
1968	10.3	10.8	12.2
1969	10.4	10.9	11.5
1970	10.6	10.8	9.3
1971	9.6	11.0	9.7
1972	5.1	11.2	10.6
1973	8.2	12.8	12.8
1974	4.8	13.9	14.9
1975	11.0	14.4	11.6
	Percent return on sales		
1963	1.2	2.4	4.7
1964	1.3	2.7	5.2
1965	1.2	2.7	5.6
1966	1.2	2.7	5.6
1967	1.1	2.6	5.0
1968	1.1	2.6	5.1
1969	1.1	2.6	4.8
1970	1.0	2.5	4.0
1971	.9	2.6	4.1
1972	.5	2.6	4.3
1973	.7	2.6	4.7
1974	.4	2.9	5.5
1975	.8	3.2	4.6

* Compiled from "Moody's Industrial Manual." ** Compiled from "Quarterly Financial Reports" published by the Federal Trade Commission. Data for 1974 and 1975 are imperfectly comparable with prior data because of changes in accounting methods.

Source: Kenneth R. Farrell, "Marketing Performance in the Food Sector," ERS-653, USDA, 1977.

This away-from-home eating component of food distribution has both a "public" and an "institutional" component of which the former is much the larger (see Table 12). For those farm foods consumed away-from-home the marketing bill portion represents about 81 percent of total consumer expenditures leaving only about 19 percent for farm value. Among the major contributors to the "public" food service industry are restaurants, cafeterias, fast food outlets, lunch rooms, caterers, food contractors, food vendors and grocery and department stores selling meals and snacks. On the institutional side, schools and hospitals are the largest food service industry markets though there are a number of smaller ones.

The significance of the food service industry in the marketing of food can be readily established. Of total consumer expenditures of $250 billion for food in 1978, more than one dollar in three (or about $400 per person) was spent via the food service industry.

Fast food places more than doubled their share of sales between 1963 and 1978 going from 15 to 32 percent. And, during the 20 year period from 1958 to 1978, real sales by fast food outlets increased more than 700 percent! Volume-wise the big increase in fast food sales has come with the expansion of franchising in the 1970's. In 1972 some 33 thousand fast food outlets dispensed food for $7 billion. And by 1978, only 6 years later, franchise outlet sales had grown to $17 billion. Thus, we are even now in the midst of a major growth and restructuring of food comsumption to which the food animal industry must direct close attention and for which our past research on food demand is ill equipped to deal.

It would be a mistake to focus attention on fast food outlets to the exclusion of other important components of the food service industry or other dimensions of food marketing and distribution. Yet, a brief look at the fast food sector does provide some interesting economic perspective on an industry which handles an increasing volume of food animal products. Currently, the four largest fast food firms in order of size - McDonalds, Kentucky Fried Chicken, Burger King and Dairy Queen - account for 41 percent of fast food sales. 12/ Thus concentration in the fast food sector is high. The unusual combination of a few very large parent firms and numerous franchised outlets appears to fare well competitively as the result of several key relationships. Large parent firms can contract with suppliers to ensure dependable supplies and rigid adherence to product specifications. These parent firms can also integrate into the wholesaling and processing functions both in order to gear these activities to their individual needs and to reap the economic rewards associated with servicing these functions. And large advertising and promotion expenditures can be made to differentiate products and services and to develop consumer familiarity and loyalty. It has, in fact, been estimated that the 20 largest fast food firms spent over $270 million for media advertising in 1978. This advertising is effectively targeted both from the standpoint of products and services, on the one hand, and on appropriate consumer groups (e.g., families, teenagers, etc.) on the other hand. Improved access to credit and equity capital, effective utilization of computers and managerial resources and coordinated systems

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12/ Charles Handy, "Fast Food Industry: Growth in Establishments and Firm Size." Unpublished Paper. ESCS, USDA, August, 1979.

for building, distributing and merchandising, are all benefits of these large-scale operations. From the standpoint of franchise holders, the opportunity to enter the food service business without extensive technical know how or experience are advantages of a participating franchise. So are the benefits accruing from the advertising and control and management of products, practices and services provided by the parent firm.

Clearly, the food animal industry has a big economic stake in maintaining or expanding the share of their products which move to consumers via the food service industry. Effective economic research needs to be targeted at this important component of food demand in order to assess both the product volume and the mix of products for which it will represent effective demand in the future. And, this in turn requires improved knowledge relative to the changing life styles, incomes, tastes, etc., of consumers who generate the demand for food service.

Summary Perspective

In the process of assessing supply and demand for food animal products and the changes in their equlibrium levels overtime, one finds it easy to conclude that some changes are supply driven, other demand driven and still others are "induced" by the numerous intermediaries in the marketing and distribution system and by the regulatory agencies affecting the whole food animal industry. Moreover, effects generated from these different sources are not mutually independent. Thus, any information system capable of guiding the future of the industry will need to deal with all of these factors in both their technical and their economic dimensions.

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